The social side of curiosity

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Editorial

The Mysteries of Human Curiosity-Driven Learning and the Challenges of Translational Educational Sciences

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Curiosity-driven learning is probably one of the most fundamental mechanisms in human learning, and yet it is also probably one of the least understood. Broadly construed as spontaneous exploration and engagement with activities or material without any extrinsic goal (as opposed to searching for information useful for an extrinsic goal), many mysteries remain to be uncovered. What are the causal links between curiosity and learning? How does prior knowledge about a topic or an activity relates to curiosity about this topic? What is the role of curiosity in life-span development? Can human curiosity explain the apparently unique tendency of humans for extreme specialization? Reversely, how do different forms of curiosity (diversive or specific) evolve as children grow up and become adults? While early computational models of curiosity propose theoretical approaches to understand their cognitive mechanisms, how can we understand the affective/emotional dimensions of curiosity? And how has the linguistic concept of "curiosity" evolved in occidental culture?

These outstanding questions are discussed and developed in this issue's dialog of the newsletter, initiated by Celeste Kidd, with inspiring contributions from researchers in neuroscience, psychology, computational modelling and AI, education and philosophy: Elizabeth Bonawitz, Maya Zhe Wang, Brian Sweis, Benjamin Hayden, Susan Engel, Abigail Hsiung, Shabnam Hakimi, Alison Adcock, Moritz Daum, Arjun Shankar, Tobias Hauser, Goren Gordon and Perry Zurn.

Understanding the fundamental principles of child learning is also a key pre-requisite for designing principled educational technologies and interventions. For example, understanding how to stimulate and leverage curiosity to implement motivating educational activities that have long term learning impact is a paramount challenge. However, as argued in the new dialog initiation proposed by Georges Kachergis, other very difficult challenges need to be addressed for educational impact: how can one achieve efficiently "translational educational sciences" and get these principles used in real-world large-scale educational technologies? In this dialog entitled "Leveraging adaptive games to learn how to help children learn effectively", Georges Kachergis highlights challenges related to collaborations between cognitive scientists and game developers, how to deploy real world experiments, and how to enable scientific understanding when many variables cannot easily be controlled? Those of you interested in reacting to this dialog initiation are welcome to submit a response by December 15th, 2018. The length of each response must be between 600 and 800 words including references (contact pierre-yves.oudeyer@inria.fr).

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The Social Side of Curiosity

The point I would like to make with this response is that if you communicate contingently with your child, you provide a "social glue" that increases the child's self-confidence and fosters curiosity. This idea has its roots in anecdotal reports that parents dress up like their children to show their support. In the following, focusing on early childhood, I will first talk about the importance of the quality of social interactions, and of imitation in particular, for children's development. I will then briefly describe how this might be linked to the development of children's curiosity.

Imitation is an important source for children's learning from and communicating with the social environment. Early in life, children start imitating other's behaviour. Soon after, they selectively imitate and take into account contextual information. Children are more likely to imitate a model who has been reliable in the past (Zmyj, Buttelmann, Carpenter, & Daum, 2010) or who is more familiar to them (Buttelmann, Zmyj, Daum, & Carpenter, 2013).

Children use imitation to communicate when verbal competences are still limited (Nadel, Guérini, Péze, & Rivet, 1999), a behaviour that is still observable in adults in the form of mimicry (Chartrand & Bargh, 1999). This and other forms of contingent interactions result in an increase in the sense of affiliation between two interaction partners. Children who perceive a person as acting temporally contingent to the child more often use social referencing with her when exploring novel events (Striano, Henning, & Vaish, 2006). Being contingently mimicked by another person results in an increase of prosocial behaviour (Carpenter, Uebel, & Tomasello, 2013). Above that, the quality of nonverbal and verbal interactions with children, for example through fluent and connected communication has a substantial impact on language development (Hirsh-Pasek et al., 2015). To summarise, imitating and being imitated helps increasing the social bond between two interaction partners (Lakin, Chartrand, & Arkin, 2008).

How can this be translated to the development of curiosity? Being curious results in an increased likelihood of experiencing novel situations. Whether or not such a situation is perceived as a learning opportunity that should be approached is often not clear to the child.

To decide whether or not to approach, children make use of information provided by their social interaction partners, usually their primary caregivers. Children are more prone to learning when they can use their primary caregiver as a secure base (Waters & Cummings, 2000), they are more likely to approach an unfamiliar situations when positively supported by caregivers' emotions (e.g., Klinnert, Emde, Butterfield, & Campos, 1986), they develop better self-regulation and effortful control (Drake, Belsky, & Fearon, 2014). Thus, (contingent) reactions of parents to their children's behaviour are important for the development of trust in their parents as reliable sources of information and a safe base for the curious exploration of the world.

Based on this line of argumentation, successful extreme specialisation, a form of sustained curiosity, is more likely to develop within a high quality social network where a curious individual receives the social support to approach novel learning opportunities as often as possible.

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